DOCUMENT RESUME

ED 155 087 SO 010 901

AUTHOR Johanningmeier, Erwin V.
TITLE A Study of the Work of Daniel Starch: A Chapter in the History of the Application of Psychology and Statistics to Education and Other Areas.
PUB DATE 28 Mar 78
NOTE 39p.; Paper presented at Annual Meeting of the American Educational Research Asscciation (Toronto, Ontario, March 27-31, 1978); Not available in hard copy from EDRS due to poor reproducibility of original document

EDRS PRICE MF-$0.83 Plus Postage. HC Not Available from EDRS.
DESCRIPTORS Academic Achievement; Academically Gifted; Accelerated Programs; *Educational Diagnosis; *Educational History; *Educational Psychology; Educational Research; Educational Testing; *Grading; Measurement; Reliability; Sampling; *Statistics; Student Ability; Student Evaluation; Student Testing; Tests; Validity
IDENTIFIERS Starch (Daniel)

ABSTRACT

This document examines the work of Daniel Starch, emphasizing his work in educational psychology and advertising. After earning his doctorate in psychology (1906), Starch attempted to apply the findings of the new science to education and to advertising. This application met with much success. In advertising, he devised new sampling techniques and methods to measure what portion of sales could be attributed to advertising in any medium. In the field of educational psychology, Starch attempted to determine how to measure pupil achievement; explored the reliability and validity of grading practices; examined the use of standardized testing to improve instruction; investigated the efficiency of education; showed concern for the gifted student and accelerated programs; applied statistics to education; and attempted to determine the worth of school subjects. Starch also wrote a text in educational psychology which led the field for about 10 years. This text differed significantly from the works of other leading psychologists, especially in the areas of instinct and subject matter. (Author/JK)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

010 901

ED155087

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

A Study of the Work of Daniel Starch:

A Chapter in the History of the Application of Psychology and Statistics to Education and Other Areas

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
E. V. Johanningmeier
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

by

Erwin V. Johanningmeier

University of South Florida

Tampa, Florida 33620

Presented at 1978 Annual Meeting,

American Educational Research Association

Session # 8.20, March 28, 1978

SO 010 901

Printed in the U.S.A.

Daniel Starch is an example of a late nineteenth century farm boy who met with academic and professional success in the first half of the twentieth century. He may even be one of those whom Daniel Boorstin has described as "Go-Getters,"[1] though we should add a "dignified Go-Getter." His father, Frank, arrived in the United States with his parents in 1855 from the Sudentenland in Bohemia. The Starch family was hard-working, prosperous, and apparently very hearty. The current edition of Who's Who--not Who Was Who--still carries an entry for Daniel Starch who was born in 1883.

After completing his elementary schooling in a one-room rural school located on his father's 420 acre farm--the largest in LaCrosse, Wisconsin at that time--Daniel Starch attended the Charles City Preparatory School in Iowa. From there he went on to the Morningside College in Sioux City, Iowa where he majored in psychology and mathematics, subjects which prepared him to pursue that new and booming science, experimental psychology. He was graduated from Morningside College in 1903 at the age of nineteen--the youngest in his graduating class. Interested in the new field of experimental psychology, he secured a fellowship from the State University of Iowa in Iowa City where Carl Emil Seashore had been recently appointed professor of psychology, and began work for his M.A. degree in psychology and education. In 1904 he

was awarded his M. A. degree and elected to stay on at Iowa to continue his work in psychology. He received his Ph.D. in 1906 after completing his doctoral thesis, Localization of Sound (1905), in 1906.

After earning his doctorate, Starch remained at Iowa for one year as an instructor in experimental psychology. He then moved to Massachusetts to serve as an instructor in experimental psychology at Wellesley College and to study experimental psychology at Harvard. In 1908 he left Massachusetts to begin his twelve-year tenure at the University of Wisconsin. He then began to write several books in which he attempted to apply the findings of the new science, psychology, to education and to advertising: Principles of Advertising--A Systematic Syllabus (University Cooperative Co., 1910); Experiments in Educational Psychology (Macmillan, 1911); Advertising: Its Principles, Practice and Technique (Scott, 1914); and Educational Psychology (Macmillan, 1919).[2]

Starch's applications of psychology to practical affairs, advertising and education, met with success.[3] His growing reputation in the psychology of advertising led to his appointment as a lecturer at the Harvard Graduate School of Business in 1919. From that time most, though not all, of his professional efforts were in the field of advertising. While at Harvard, he took an assignment from

the Liberty Mutual Insurance Company which was looking for an effective way to advertise automobile liability insurance. The company submitted half-a-dozen layouts and Starch evaluated them. His "findings showed that the ad using a picture of an automobile collision received first attention and reading."[4] In 1962 it was reported that "although the agencies handling its account have changed over the years, Liberty Mutual still uses the theme recommended by Starch, and readership reports over the years have shown consistently that ads with this theme are high in both 'noted' and 'read most' scores."[5]

Starch devoted considerable attention to the problem of measuring readership of advertisements even though he was told it could not be done. In 1922 he had completed his work on his readership-scoring method. He reported his method in 1923 in Principles of Advertising (Shaw)--a book which became a standard text in the field for several years. He reported that the book's "royalties were more than my year's salary as a teacher."[6] In the same year, 1923, he founded his own research company, Daniel Starch and Staff.

Starch left Harvard in 1927 to devote full time to his company and related activites. In 1963 his company had offices in Chicago, Toronto, Montreal and Sydney besides the home office in Mamaroneck, New York. Within the United States alone the company employed nearly 900 people.[7]

It appears that Starch will be best known for two accomplishments; first, for formulating Netapps in 1958--a method for determining what portion of a product's sales can be attributed to advertising in any media;[8] and second, for determining how many families had a radio in 1928. When NBC asked him this question, Starch, in order to answer it, had to design a probability-sample technique to determine how well a random sample of a given area would be representative of the whole. Starch's methods were successful, for the survey taken by the Bureau of the Census in 1930 showed that Starch's estimate was within four per cent of that established by the 1930 Census.

Though Starch did publish work on human behavior and education with Hazel Stanton and Wilhelmine Koenth in 1936 and 1941 (Controlling Human Behavior, 1936 and Psychology in Education, 1941), his career in educational psychology is basically limited to the period before his tenure at Harvard, 1906-1919. His work in educational psychology may be examined under two headings: first, his attempts to determine how to measure the educational product (the measurement of pupil achievement); the reliability of grading practices; and his attempts to determine the worth of school subjects; and second, his text, Educational Psychology first published in 1919.

In a review of Starch's Experiments in Educational Psychology Frank N. Freeman of the University of Chicago observed that Starch's work represented "one type of educational psychology." He went on to point out "that there is also another, and at least equally productive, type, which consists in the experimental analysis of specific educational processes, such for example, as reading, writing, spelling, and counting."[9] According to Freeman, statistical studies which were psychological in nature could be profitably applied to educational problems. Examination of Starch's work subsequent to Freeman's review suggests that he may have followed Freeman's advice. He soon produced a series of articles which dealt with the measurement of ability of efficiency in various school subjects. During 1912-13, he collaborated with E. C. Elliott in the publication of three articles in the School Review on the reliability of grading in high school English, history, and mathematics.[10]

The now well-known Starch-Elliott studies were among the first of their kind. Before them there were only a few similar studies: one by Edgeworth in 1890; Max Meyer's "Grading of Students" in 1908; Walter F. Dearborn's "The Relative Standings of Pupils in High School and in the University" in 1909 and his School and University Grades in 1910, and Franklin W. Johnson's "A Study of High School Grades" in 1911.[11]

In their studies Starch and Elliott had set out to determine how widely grading practices varied. Their findings consistently revealed that marks assigned to a given paper by different readers varied widely. The wide ranges of variation apparently led Starch to write his book Educational Measurements in 1916. In his text he admitted that most educational measurements were still in the experimental stage but observed that "the need of definite, objective measures of educational products" was sufficiently "great" to proceed with the task.[12] A year earlier Starch had offered the judgment that "the current movement for measuring school products is one of the three or four most important fields of investigation in the scientific study of educational 'problems'."[13] Those tests and scales which did exist could be further refined through more use and serve as "tools for evaluating quantitatively the results of methods and factors in teaching and learning, and for examining various aspects of efficiency of instruction and administration of school systems." About the principle of educational measurement Starch had no doubts. The old time pedagogy was giving way to the new. In its place were "quantative studies, objective measurements, and carefully observed facts." In a statement reminiscent of Thorndike, Starch wrote: "Any quality of ability of human nature that is

detectable is also measurable."[15] The task of education was "to discover more and more accurate means of measurement."

The practice of educational measurement only needed to be improved. It did not need to be defended. It was part of the day-to-day work of the school. It was either used or mis-used each time a grade or mark was assigned. There were "numerous and momentous problems" in the working of a school which depended upon marks. Decisions about "promotion, retardation, elimination, honors, eligibility for contests and societies, graduation, admission to higher institutions, recommendations for future positions" all depended upon the grades a student had been assigned.[16] In all aspects of educational activity and human activity we made measurements. We ascribed better than or worse than to a person or a situation. We spoke of what was more useful or less useful. We spoke of greater and less. In short, we made all sorts of comparative judgements about all sorts of matters. In place of these rough comparative judgements Starch wanted us, especially in school matters, to be more precise. Educational measurement would allow us to refine our judgements and enable us to "express them in terms of known units of a definable character, so that we may be able to say, for example, that a pupil can read three words per second of a certain passage and to report so and so much of it, that he knows the English meaning of

2,000 Latin words and can translate without error sentences of specified difficulty."[17] If there were educational "products or by-products" which could not be judged to exist in some quantity, then, Starch advised, "we may be suspicious of their actual existence."[18]

Although educators were generally so confident of their marking procedures that they often used fractions even when they had a scale of 100 percentage points, there was, Starch maintained, no reason to believe that the grades were reliable. Numerous studies had shown that there were wide ranges of differences in grading practices from school to school and even from teacher to teacher within a department. The per cent of "excellent" grades and the per cent of "failures" in the same subject in the same department varied too widely, too frequently. Even the folk wisdom about grades was in error: "Contrary to current belief, grades in mathematics are as unreliable as grades in language or in history."[19] Investigations had shown that "the mathematics instructors did not agree any more closely with their own marks than the language or science instructors."[20] It was found that the marks assigned to a set of papers in plane geometry by 116 teachers ranged from twenty-eight to ninety-two.

To remedy the wide diversity of practices in marking, Starch advised adoption of appropriate marking scales and standards for the distribution of marks. Those scales which used 100, 99, 98, 97 . . . . 0 were not appropriate, for they had no "objective validity." The divisions on a marking scale had to be large enough to allow seventy-five percent of all measurements of a student's paper to fall within that division in order to insure validity. Starch's own calculations recommended that a scale with five marks be used. The scale and the distribution which he recommended was as follows:

> A or Excellent, which should be assigned to approximately 7% of the pupils.
> B or Superior, which should be assigned to approximately 24% of the pupils.
> C or Average, which should be assigned to approximately 38% of the pupils.
> D or Inferior, which should be assigned to approximately 24% of the pupils.
> E or Unsatisfactory, which should be assigned to approximately 7% of the pupils.[21]

Starch further advised that letters and symbols were preferable to words such as Good or Fair or Poor or whatever. Words had "moral implications" which Starch seems to have wanted to avoid, though in his text on educational psychology he observed that students with high marks are usually of superior character.[22]

As can be readily seen by inspecting the grade distribution Starch recommended, he urged that "marks on the whole and for large groups of pupils of usual ability should be distributed with a reasonably close conformity to the normal, bell-shaped, probability curve."[23] Like Dearborn he observed that since human physical traits and psychological traits to the extent that they had been measured conformed to the probability curve, there was no reason why all marks should not be normally distributed. While there were factors which tended to skew the curve in one direction of the other, they ultimately counterbalanced each other. For example, the elimination of the poor students from schools, especially in the upper grades, and the improved performance of students because of good teaching were often offset by the lower performance of students who did not always employ maximum effort.[24] Moreover, Starch explained, the elimination of the poor students was "not a cutting off at a definite point of the curve, but rather a smooth shaving off along the entire range."[25] Starch believed that marks would "be assigned much more justly if they are assigned with reasonably close conformity to the probability distribution."[26] During this period, Harold O. Rugg presented data which showed "that the normal distribution did not hold in some cases and that many factors affecting marks were not susceptible to an assumption of normality."[27]

To assist educational workers in the area of educational measurement, Starch provided several chapters on the testing of ability and school performance. In fact he devoted a chapter to testing in each of the following areas: Reading, writing, spelling, grammar, arithmetic, composition, drawing, Latin, German, French, and physics. Each of the chapters was well organized. Tests, how they could be secured, how they were scored, and what they tested were all included. A teacher of a given subject was effectively provided a convenient recipe from Starch for testing and grading in the specific subject. In his educational psychology text he devoted some 200 pages to these same topics. In fact, the resumé he provided on "the results of experimental studies in school subjects" had "never before been attempted in a text on educational psychology."[28]

In the last Chapter of Educational Measurements Starch explained how standard tests could be used in school experiments. He observed that while psychologists had collected "a very considerable body of facts about the learning of more or less artificial material such as syllables, words, poetry, prose and symbols of various sorts," there was "not a single school subject regarding which we have anything more than a fragmentary psychology of the factors and conditions that affect the progress of learning in that

particular subject."[29] School teachers could, he explained, use standard tests in educational experiments in their classrooms. They could divide students into groups, administer the tests before instruction, after instruction and compare results. This could be done without interrupting the normal da-to-day operations of the school or classroom.

Starch's advice on how to conduct educational experiments in the classroom is not particularly significant. However, the language he used to describe what we would now call a control group and an experimental group is significant. He advised teachers that they could easily use "the equal squad method." He explained that the equal squad method "has been used in a limited way in various types of investigations, not so much with human beings as with animals and plants in agricultural experiment stations."[30] It was a method which held great promise for education.

As we know, the equal squad method has been widely used in what we term educational research. How fruitful it has been may still be an open question. However, Starch does remind us that the basis of educational measurement is rooted in agriculture and in statistics. The methodology of measurement and educational research is not unique to education. It is a borrowed tool. If we remember that the tool came from agriculture and statistics, we may begin to view our schools and how they work and the culture in which

they exist somewhat differently. In a recent paper, "Education and Social Change," Brian Simon claims that the tradition of applying statistical concepts to psychological phenomena started by Galton and extended by Karl Pearson and R. A. Fisher can be challenged. "Now," claims Simon, "it can be argued that these methods are not strictly applicable to spheres other than agricultural botany, but they so enhanced procedural rigor as to prove irresistable."[31]

Starch's text, Educational Psychology, was the most widely used book in the field for about ten years.[32] It was reprinted thirteen times, and a revised edition appeared in 1927. The importance of Starch's text in investigating the doctrines of educational psychology in the United States appears in a study conducted by H. H. Remmers and R. B. Knight in 1922.

Remmers and Knight had set out to answer the following question: "To what extent do the beginning courses in educational psychology--which represent the sum total of the training in psychology that all but a negligible part of young teachers in training receive--attempt to give the prospective young teachers a mastery of the subject through an experimental approach?"[33] They observed that a comparison of texts in the field showed "a decided divergence in point of view, organization, and content." They further observed

"that there are some fundamental differences in viewpoint may further be seen by comparing that of Starch and Thorndike, who as indicated by the returns are the leaders in educational psychology."[35]

In 1925 O. B. Douglas surveyed seventy-three institutions to assess the status of introductory courses in educational psychology. Douglas also reported some of the findings of the Remmers and Knight study of 1922. Remmers and Knight had forty-one usuable replies. They showed that Starch's text was mentioned eleven times as the text used in the introductory educational psychology course. Thorndike's text was mentioned ten times. There were thirty-two other texts mentioned, but only four of them were named five or more times. Douglas found that in March, 1924, Starch's text was still the most frequently used text. Thorndike's had fallen to sixth place. Starch's text was mentioned twenty-four times and Gates' text which was now in second place was mentioned eighteen times. Starch's text was most popular in courses given at the Sophomore and Junior levels. Twenty of the twenty-eight schools which used the Starch text used it at either the Sophomore or the Junior level.[36]

Remmers and Knight reported that they had wanted to provide an analysis of the vaious texts but found so much diversity that they had to abandon the analysis. However, they did observe that there were significant and fundamental

differences between Thorndike and Starch. They noted that while Thorndike devoted all of Volume I of his three volume work. Educational Psychology, to instinct under the rubric of "original tendencies," "Starch definitely belittles the place of instincts in educational practice."[37] The 1920 review of Starch's text in the Journal of Educational Psychology noted that Starch "points out that instincts as such have very little significance for education, and that the chief educational doctrines based upon instincts (dynamic theory of instincts, transitoriness, and recapitulation) have very little justification in verified fact."[38] The review also went on to offer the judgement that Starch's was a "sane view" and expressed "hope that it will tend to neutralize the overemphasis of instincts that has been prevalent in educational discussion since James."[39]

Though Starch reproduced Thorndike's list of forty-two instincts, he had little use for it. The true number of instincts as well as how much learning was involved in their activity was still a matter of debate in his opinion. When it came to the relationship between the forty-two instincts and the learning of a given school subject, Starch was even more definite. Early in his text Starch instructed his readers to examine each instinct and attempt to determine "to what extent each one may be

appealed to or used in teaching the various subjects."[40] He was confident that "two-thirds or three-fourths of them are probably never immediately but only indirectly concerned in school exercises, and most of the remaining ones, such as rivalry, cooperation, collecting, and hoarding, are serviceable chiefly as general motives."[41] Though Starch maintained that "the most important role of instinct in education lies in motivating and energizing the learning process," he virtually reduced them to "R's" in a "S-R" model. "The instinctive elements in learning any school subject are, "he argued, "for the most part simple reflex actions or undeveloped connections."[42]

Starch's position on the relative insignificance of instincts in education is important. It is, as we just remarked, a rejection of James' position and a dismissal of much of G. Stanley Hall. As such it was a departure from the prevailing point of view. For example, in 1911 Bird Baldwin made the claim that after James brought instinct into educational discussions, there was no "reputable book in educational psychology" that did not devote "several pages or chapters to instinct."[43] According to Baldwin, James had successfully shifted the basis and aim of education as "the organization of acquired habits of conduct and tendencies to behavior" was very different from Plato's moral aim, Socrates' quest for truth, Luther's service to

the state and church, or even Spencer's preparation for complete living. James' emphasis on native tendencies or instincts "directed attention to the native resources of the child and the place these native tendencies to reaction must necessarily have in any scheme of education in which children are concerned."[44] The emphasis on native tendencies, or instincts, provided an alternative to the Herbartian pedagogy and psychology which emphasized the organization of subject matter. Starch rejected instinct as an important concept and emphasized testing, measurement, and reliable grading of students' performances in the variousschool subjects. In opting for measurement of the educational product and emphasis on the test, he moved the emphasis back to the subject matter, at least to the measurement of how students respond to the subject matter presented to them. The requirements of a good test shaped the organization of teaching and subject matter. For example, a good test met four conditions:

> (1) The test or scale for a given subject should measure the knowledge or skill acquired wherever proper instruction or training in the field is provided. The material of the test should be based upon the material that has actually been covered or should be covered in the subject. (2) The test ought to permit of accurate, impersonal evaluation. (3) It ought to permit of duplication or repeated application almost indefinitely. (4) It ought to measure adequately the knowledge, skill or ability for which it is designed.[45]

Effective use of standard tests would effectively minimize the teacher's role in teaching. What the teacher could offer personally would have to fit the test. Specification of the product, what we now call learning outcomes, would lead to specification of the materials and processes to be used.

Dean A. Worcester's 1927 analysis of several educational psychology texts clearly shows what Starch's emphases were. Worcester reported that while Gages' text which was the second most widely used text in 1924 devoted twelve per cent of its space "to a discussion of the receiving, connecting and reacting mechanisms: and four per cent "to a description of conscious states and processes,"[46] Starch did not even deal with these topics--topics which purport to deal with how individuals learn, how they make sense of stimuli, experience or whatever. Starch did devote forty per cent of his text to the psychology of various school subjects and to tests in the school subjects. While Gates devoted four per cent of his book to the transfer of training issue, Starch devoted fourteen per cent of his text to transfer. In his treatment of transfer, Starch used approximately thirty tables and three graphs. About five per cent of Starch's work was devoted to individual differences--differences which, as we shall see, were quantitative rather than qualitative.

For Starch education was "the production of useful changes in human beings." Though he cautioned that "useful" should not be narrowly defined so as to exclude "all changes which will broaden and enrich the life of the individual,"[47] his emphasis was on finding whatever "exact information" there was and in determining which methods of education were "most economical."[48] The problems of educational psychology which were in accordance with the definition of education as producing useful changes were four:

1. What changes are made in human beings?
2. What are the agencies by which the changes may be brought about?
3. What are the capacities which human beings possess for acquiring changes?
4. What are the most economical methods by which these changes may be brought about?[49]

The last two problems were basically psychological problems. The first was a philosophical and sociological problem, for its answer depended not on psychological findings but on "our ideals of life and our views of society." The second problem was partly sociological because the agencies which a society selected for education depended upon its physical and social content. The second problem was also a psychological problem because it required study of how various school subjects--Latin, physics, grammar, or whatever--might bring about changes in mental processes. How to test a student's performance in a school subject and how performance in one subject related to performance

in another subject were topics to which Starch gave considerable attention. For him education was effectively reduced to school subjects.

Waste in education was for Starch, like many others of his period, a problem which presumably had a solution. Hindsight allows us to observe that the little knowledge we thought we had about learning was indeed a dangerous thing. However, that little knowledge seems to have made us more sanguine than we should have been. Very early in his text Starch presented his readers with a passage which to some may sound like a passage from Rabelais. It goes as follows:

> For example, we do not know with any definite assurance what is the most economical amount of time to devote to any one of the school subjects. From such investigations as have been made, we may infer that there is an enormous waste in our educational practices which is indicated by such facts as the following: It has been found by recent tests and measurements that some schools obtain just as good results by devoting only one-half as much time to writing as other schools do. Similar facts have brought out in the case of reading, arithmetic, and other school subjects. Schools which have devoted as much as 100 minutes a week, or 20 minutes a day, have obtained no better results than other schools devoting 50 minutes a week, or 10 minutes a day, to the same subject. If these facts actually represent the real possibilities, it seems quite obvious that here is an enormous waste in our schools and this waste is far greater than we realize until we make definite calculations of the possible saving of time. If by some means it were possible to same one minute a day for every school day during the eight years of a child's school life, we would be able to save

> one entire week of school time. If we could save four minutes a day for the same length of time, we would be able to save one month; if we were able to save 18 minutes a day, we would be able to save one-half a school year; and if by more economical methods of learning and distribution of time we were able to save 36 minutes a day for eight years, we would be able to save an entire school year. Such a saving is not impossible; indeed, by a better use of time and more effective methods of learning, it is highly probable. Eighteen minutes a day would mean a reduction of only 4 1/2 minutes in each of four subjects; 36 minutes a day would mean a reduction of only 9 minutes a day in each of four subjects.[50]

We might observe that time is money and ask whether haste really does make waste.

Although enough was not known about how we learn to enable us to shorten the school day and the school year for all, it was possible to do so for some. This was so because we are all the same and not the same. According to Starch, "differences among human beings are quantitative rather than qualitative."[51] Each of us has the same make-up. We all have reflexes, instincts, and the capacity to perceive, discriminate, to attend, to retain, to reason, and so on. We differ in that the strength, or amount, or abilities differs. What we might want to call qualitative differences "are qualitative only in the sense that combinations of varying amounts of diverse traits occur."[52] The range of differences among us was great, but it was quantitative and could be measured. As Starch explained to his readers, "we find that on the

average the best pupil is able to do from two to twenty-five times as much as the poorest pupil, or is able to do the same task from two to twenty-five times as well as the poorest pupil."[53] All facets of human performance could be reduced to either time or amount.

To explain the nature of human variation Starch employed the normal curve of distribution. That the normal curve may only represent how widely distributed variations were and not what they meant to either an individual or a society was not a question with which Starch dealt. To know that human abilities varied in accordance with the normal curve was to know the nature of human variation. To illustrate the nature of human variation he presented in graphic form a number of different distributions. They included: the memory ability of 173 university students, ability of 164 university students to cancel A's in one minute, ability of 164 persons to cancel a specified geometrical figure in a page of figures in one minute, ability of 135 persons in giving associations to a stimulus word in fifteen seconds, chest measurement of English soldiers, the height of 1,052 women, the head girth of 1,071 boys, 16-19 years, and the number of heads up in tossing ten pennies 1,000 times. After these presentations, the theoretical probability was presented so the student could see how all distributions of human traits or abilities approximated a normal distribution.

Just as improved methods of teaching based on scientific knowledge about learning might result in the savings of minutes and perhaps years so did the variability in human ability make possible the savings of school time. Starch reported that measurement of students' abilities in the various school subjects showed that "the differences in abilities in school subjects are fully as wide as in special psychological capacities."[54] Since the wide range of differences were "probably due primarily to native ability rather than to differences in opportunity, training, or environment," a wide range of ability could be expected in every class and in every school. Even after the abilities of the students in the various school subjects were averaged, there was a range such that the superior second and third grade students were nearly equal to the poorest students in the eighth grade. According to Starch, "this enormous range of ability and the resulting overlapping of successive grades, is probably the most important single fact discovered with reference to education in the last decade."[55]

Proper promotion and classification of students would allow thirty-three per cent of them to finish eight grades of school in less than eight years; thirty-three per cent would finish in eight years; and thirty-three per cent would need more than eight years to finish eight grades satisfactorily. Not to separate students according to their abilities was

wasteful. As Starch put it "to keep an ordinary class of pupils together is no doubt very wasteful in time both for the gifted as well as for the stupid pupils."[56] Each group would suffer as proper attention was directed at the other.

There were, Starch observed, two ways to meet the needs of the superior, industrious students. One was to "attempt to keep the pupils of a given class together but vary the manner of instruction for the pupils of different capacities;" the other was to "keep the manner of instruction uniform but promote or retard pupils according to their achievements."[57] Though various plans for varying the methods of instruction had been in use for the past thirty years, they were not always reliable. These plans seemed to work best "when carried out under the immediate supervision of those who devised them." However, when others attempted to employ the plans for individualizing or varying instruction, "they have not been so satisfactory."[58] Starch cautioned that plans which rely on individual individualization of instruction may neglect the necessary "social stimulus" that all students need. He opted for those programs which allow for rapid acceleration. A practical progra which allowed for acceleration was the St. Louis Promotion Plan as described by W. J. Stevens in 1914.[59] In the St. Louis Schools each grade was divided into four ten-week quarters. At the end of each quarter, average students moved on according to schedule, and the superior students were allowed

to move on to the "next higher class." Stevens' study of 1,439 students in four elementary schools in St. Louis showed that "about 1% of the pupils required approximately four years, 6.3% five years, 22.8% six years, 34.6% seven years, 24.9% eight years, 7.5% nine years, 1.7% ten years and 1.3% eleven to thirteen years to complete the eight grades."[60] Stevens' findings agreed quite closely with Starch's own calculations on how many students needed more or less time to complete eight grades of work successfully.

That the schools seemed to give more attention to children at the left end of the normal curve than to the right end concerned Starch. He related that "the schools have given special attention to the backward pupils by organizing separate classes for them and by giving them extra help, but they have given little or no attention to the advanced pupils."[61] When he revised his text in 1927, he expanded his chapter on "Variation in Human Capacities" and gave even more attention to the need of special provision for students at either end of the normal curve. Children at either end of the normal curve needed special attention. Fully five per cent of those who enrolled in the public school were "so inferior physically, mentally, educationally, and socially that they may properly be identified as 'special class children'."[62]

These were the students who needed instruction which emphasized the concrete and who should be trained for useful jobs. Teaching special class children jobs to make them economically independent would make life happier for them and allow savings of "thousands of dollars of tax money which would otherwise be spent for law enforcement and institutional care."[63] Starch, as we have seen, recommended that children at the other end of the normal curve be allowed to move on quickly. In the first edition of his text he complained that "school progress is determined too much by the calendar and not enough by capacity" To free schools from the calendar would benefit society: "Society would be compensated far more for paying at least equal attention to the gifted pupils since they primarily will determine the future progress of mankind."[64] In the revised edition of his text he also argued that the superior students should enjoy the benefits their superiority would bring them as adults. Presumably, these were the students who would benefit rather than tax society. In any event, it is clear that Starch wanted to promote achievement. Achievement and character were, for Starch, closely related described the relationship as follows:

> Considerable information concerning the character traits of a child may be inferred from his mental and educational test data. If in educational attainment a child is one quartile position above that customary for children of his intelligence quotient, excellent character traits are likely to be present; if his educational attainment accords with that customary for children of his intelligence quotient, average character traits may be inferred; if, however, his educational attainment is one quartile position below that customary for children of his intelligence quotient, poor character traits are probably.[65]

It may be that the science of psychology and its new modes for measuring human traits and accomplishments helped Starch to discover a not very new form of early American Calvinism. In place of the selected or the saved we have the able. We know the able are good because they achieve and because they achieve they are good. In place of the selector is nature, operating through heredity. On the nature-nurture question Starch was on the side of the nature. That was the position one had to embrace if he followed the findings of the psychologists carefully. Somehow, in a period of nearly three hundred years Latin, Greek, and Hebrew were replaced with statistics, measurement, and experimental psychology.

Though Starch cautioned that it was necessary to consider the social and physical status of the student in acceleration programs, he clearly favored them to the enrichment programs. Acceleration programs typically required students to accomplish more than normal students

proceeding through eight grades in eight years. Programs which varied requirements so as to occupy the time of the superior student were not completely satisfactory. While the student did receive the benefit of accomplishing additional work, he did not receive the full benefit of his ability. Starch observed that outside the school, what he called "practical life," "the capable man performs several times as much work or makes several times as rapid progress in the same period of time as the incapable man, both having equal opportunities." Starch asked: "Why should not the schools permit progress according to ability and achievement?"[66] The possibility of moving through school more quickly than the normal rate would probably disincline students from dawdling and motivate them to do as much as they could as quickly as they could in school. Believing the "rewards in adult life are more nearly according to ability and performance."[67] Starch believed that creating the same conditions in the school would benefit public schooling. Not to so organize schools was to be unfair to the gifted. Moreover, "this would make for maximum progress based upon ability and performance, not upon birth or social caste."[68]

There is some temptation to conclude that Daniel Starch is still one more instance of a professional educator who

got caught up in what Raymond Callahan called the "cult of efficiency" a few years ago. It is true that Starch used the language of the era. He spoke of "efficiency," "waste," and in writing about the educational "produce" he brings to mind the industrial-manufacturing images and metaphors. We could show how we are still thinking in the same ways about education by pointing out how John I. Goodlad has given us the same old view of schooling with the modern-systems-management metaphor.[69] We could also show how Americans have seemingly always been fascinated by statistical knowledge. When Francis Grund related his observations of American education in 1837 he noted that the Americans were "great admirers of statistics." He also reported that "the rage for statistical tables, as a means of obtaining knowledge in a quick and easy manner, exists in the United States to a still greater degree than in England or France."[70] Daniel Boorstin has recently observed that the "distinctive fact" about our use of statistics in the United States "was not their rise as a learned speciality," but their "unprecedented popular diffusion." Boorstin also suggests that in "the twentieth century a new kind of number consciousness captured the public mind."[71] However, it may be more fruitful for our future inquiries into educational research and educational psychology if we take the tack suggested by David Hamilton in his essay, "Educational Research and the Shadows of Francis Galton and Ronald Fisher."[72]

It took very little time for the influence of Galton to reach the United States. In the 1870's Galton was promoting the new study of "anthropometry" and arguing that anthropometric records be made and kept. Soon the folk would pay him to collect his data. He opened a laboratory in London in 1882 at the South Kensington Museum where in exchange for a fee any patron could have his physical measurements taken and be given vision test, hearing tests, and have his reaction times measured. In 1893 Joseph Jastrow of the University of Wisconsin found many at the World's Columbian Exposition in Chicago who were willing to have psychological tests administered to them. James McKeen Cattell who was to become Thorndike's mentor and who had described Galton as the greatest man who he had ever known[73] was probably the first to use the term "mental tests" when he administered a battery of tests to one hundred University of Pennsylvania freshmen. At Clark University Franz Boas was teaching courses in anthropometry and anthropological statistics in 1889.[74] In 1891 Boaz with encouragement from G. Stanley Hall began measuring fifteen hundred Worcester school children.[75] Hall had already surveyed "The Contents of Children's Minds" in 1883.

The use of statistics is not limited to educators and schools. Indeed, it has been applied to the administration

of nearly all affairs of the state and to nearly all those enterprises we might call social service institutions. Many years ago William H. Allen, the general agent for the New York Association for Improving the Condition of the Poor, informed us of the origin and meaning of the word statistics. Allen's words should tell us who the benefactor of the statistical process is. He informs us that "this much hated word," statistics began life in 1648 as the name for facts "which concern obviously the prosperity of the state, either in obstructing it or contributing to it." Our word, statistics, he tells us comes from a German word--Staatsmerkwürdigkeiten--the literal translation of which is: "Of the state--note--worthy--things."[76]

The United States as a state appears to have realized what use it could make of statistics in the early twentieth century. The statistics it gathered at the hands of psychologists turned army officers during the administration of Alpha and Beta tests is but one example. An examination of the careers of those who received doctorates in the social sciences in the early years of the twentieth century may prove to be instructive. Social scientists, armed with statistical procedures, aided several branches of government adopt the new science. In the space we have we can give two examples: Leonard P. Ayers and Edmund Alonzo Day.

Leonard Ayers, as most of us know, employed his knowledge of the social science methodology to the problems of school dropouts and retardation in Laggards in Our Schools in 1909. While holding several important public positions between 1917 and 1920, Ayers applied the techniques of social science research to national defense, war, and peace-making. In April, 1917 Ayers and eight members of his staff from the Russell Sage Foundation volunteered to organize the Division of Statistics of the Council of National Defense. After six months, Ayers was also responsible for statistical reporting and analysis for the War Industries Board, the Priorities Committee and the Allies' Purchasing Committee. In addition to these duties, Ayers was providing services to the U.S. Army which had no facility for statistics until Ayers was made a lieutenant colonel and assigned such responsibility. Soon he had a staff of fifty and was directing the Statistical summary of the war, The War with Germany (1919) brought him considerable public attention and he soon returned to France as the chief statistical officer to the American Commission to Negotiate Peace. Upon returning from Versailles in 1920, he became vice-president and chief economist of the Cleveland Trust Company. He was in charge of statistics at the bank.

Edmund Alonzo Day who was awarded a Ph.D. in economics from Harvard in 1910 also used his statistical skills in the war effort. From September to December, 1918 he served as a statistician for the Central Bureau of Planning and Statistics of the War Industries Board. For seven months during 1918-19, he served as a statistician for the Division of Planning and Statistics of the United States Shipping Board and from June to August 1919, he served as director of the Division. Subsequently he served as a Director of the Rockefeller Foundation, a representative on the Preparatory Commission of Experts for the World Monetary and Economic Conference in London in 1933 and as President of Cornell University. He was also a member of the NEA's Educational Policies Commission.

It appears that those equipped with statistical skills were able to help government conduct its affairs with "efficiency and order." Once their techniques were introduced, they grew and took root. How this introduction and residence has influenced American social policy and especially public schooling remains to be investigated.

In closing we can turn to William Allan who wrote that "the modern Diogenes does not go about with a lantern seeking goodness; he looks for efficiency and expects goodness to be thrown in."[77] We need to determine how much has been thrown in and how much has been thrown out.

Notes

1. Daniel J. Boorstin, The Americans: The Democratic Experience (New York: Random House, Vintage Books, 1974), Book One, Part One.

2. For biographical sketches of Daniel Starch see: Neil H. Borden, "Daniel Starch," The Journal of Marketing, Vol XXI, No. 3 (January, 1952), 265-267; Current Biography, 1963, 393-395; National Cyclopaedia of American Biography, Vol F (1939-42), 183-184; and "Starch: The Man Behind the Name, Printers' Ink, February 16, 1962, 54, 56, 58.

3. Starch was not the only psychologist-educator interested in advertising. See, for example: Edward R. Strong, Jr., "Psychological Methods as Applied to Advertising," Journal of Educational Psychology, Vol. IV. No. 7 (September, and attention to advertising Starch was only preceded by Harlow Gale and Walter Dill Scott.

4. "Starch," Printers' Ink, 56.

5. Ibid.

6. Ibid., 56, 58.

7. Ibid., 58.

8. Harvard Business Review (May-June, 1958).

9. Frank N. Freeman, Review of Experiments in Educational Psychology, School Review, Vol. XX, No. 3 (March, 1912), 204.

10. Daniel Starch and E. C. Elliott, "The Reliability of Grading High School Work in English," School Review, Vo. XX, 442-457; "The Reliability of Grading Work in Mathematics," School Review, Vol. XXI, 254-269; "The Reliability of Grading Work in History," School Review, Vol. XXI, 676-681.

11. Max D. Engelhardt, "Examinations" in Walter S. Monroe (ed.), Encyclopedia of Educational Research (New York: The Macmillan Co., 1941), 471-472; Ann Z. Smith and John E. Dobbin, "Marks and Marking Systems: in Chester W. Harris (ed.), Encyclopedia of Educational Research (3rd. ed.) (New York: The Macmillan Co., 1960). 783-784; and Walter S. Monroe and Max D. Engelhardt, The Scientific Study of Educational Problems (New York: The Macmillan Co., 1936), 454-455.

12. Daniel Starch, Educational Measurements (New York; The Macmillan Co., 1917), 1.

13. Daniel Starch, "The Measurement of Efficiency in Reading," Journal of Educational Psychology Vol. VI, No. 1 (January, 1915), 1.

14. Starch, Educational Measurements, 1-2.

15. Ibid., 2.

16. Ibid., 3.

17. Ibid., 2.

18. Ibid.

19. Ibid., 8.

20. Ibid., 9.

21. Ibid., 15.

22. Daniel Starch, Educational Psychology (rev. ed.) (New York: The Macmillan Co., 1927), 45-46. Starch's observation that students with high marks was not reported in the first edition of his text (1919).

23. Starch, Educational Measurements, 12.

24. Ibid., 12.

25. Ibid.

26. Ibid.

27. Smith and Dobbin, "Marks and Marking Systems," 484.

28. Review (unsigned) of Educational Psychology by Daniel Starch, Journal of Educational Psychology, 1920, 536.

29. Starch, Educational Measurements, 194.

30. Ibid., 195.

31. Brian Simon, "Education and Social Change," paper delivered at A.E.R.A., Washington, D. C., April 2, 1975, 11.

32. "Daniel Starch," National Cyclopedia of American Biography, 183.

33. H. H. Remmers and F. B. Knight, "The Teaching of Educational Psychology in the United States," Journal of Educational Psychology, Vol. 13 (1922), 399.

34. Ibid., 406.

35. Ibid.

36. O. B. Douglas, "The Present Status of the Introductory Course in Educational Psychology in American Institutions of Learning," Journals of Educational Psychology, Vol. 16 (1925), 403-407.

37. Remmers and Knight, "The Teaching of Educational Psychology," 406.

38. "Starch's Educational Psychology," Journal of Educational Psychology, 535.

39. Ibid.

40. Daniel Starch, Educational Psychology (New York: The Macmillan Co., 1919), 12.

41. Ibid.

42. Ibid.

43. Bird T. Baldwin, "William James' Contributions to Educational Psychology," Journal of Educational Psychology, Vol. II (1911), 376.

44. Ibid.

45. Daniel Starch, "A Test in Latin," Journal of Educational Psychology, Vol. X, No. 10 (December, 1919), 489.

46. Dean A. Worcester, "The Wide Diversities of Practice in First Courses in Educational Psychology," Journal of Educational Psychology, Vol. XXVIII (1927), 13-14.

47. Starch, Educational Psychology, 1-2.

48. Ibid., 3.

49. Ibid., 2.

50. Ibid., 3-4.

51. Ibid., 26.

52. Ibid., 28.

53. Ibid., 29.

54. Ibid., 33.

55. Ibid., 39. Emphasis is Starch's.

56. Ibid., 41.

57. Ibid., 42.

58. Ibid., 44.

59. Ibid., 45.

60. Ibid., 45-46.

61. Ibid., 47.

62. Starch, Educational Psychology (1927), 45-46.

63. Ibid., 51.

64. Starch, Educational Psychology (1919), 47.

65. Starch, Educational Psychology (1919), 45-46.

66. Ibid., 51. 67. Ibid., 53.

68. Starch, Educational Psychology (1919), 48.

69. For a discussion of how Goodlad appropriates and uses the metaphor of modern systems management see: E. V. Johanningmeier, Review of John I. Goodlad's The Dynamics of Educational Change (1975), The Humanist Educator, Vol. 15, No. 1 (September, 1976), 51-52.

70. Francis Grund, The Americans, In Their Moral Social, and Political Relations (Boston, 1837) in Sol Cohen (ed.) Education in the United States: A Documentary History, (New York: Random House, 1974), Vol. 2, 943.

71. Boorstin, The Americans, 188.

72. David Hamilton, "Educational Research and the Shadows of Francis Galton on Ronald Fisher" (Mimeograph, 1974), forthcoming in W. B. Dockrell and D. Hamilton (eds.), Rethinking Educational Research (London: Hodder and Stoughton).

73. A. A. Roback, History of American Psychology (New York: Library Publishers, 1952), 169.

74. Boorstin, The Americans, 189.

75. Ibid., 220.

76. William H. Allen, Efficient Democracy (New York; Dodd, Mead and Co., 1908), 18.

77. Ibid., 6.